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CONTENTS

ARMITAGE, RELATIONS OF HAWAIIAN INSECT FAUNA TO CALIFORNIA AGRICULTURE 1
MITCHELL, RECORDS AND DESCRIPTIONS IN MEGACHILID SUBGENUS ARGYROPILE 12
VAN DYKE, NEW SPECIES AND SUBSPECIES OF NORTH AMERICAN CARABIDAE 17
POTTS, SYSTEMATIC NOTES CONCERNING AMERICAN ACRAEINAE 31
OMAN, A NEW LEAFHOPPER FROM OCEANIA 33
PROCEEDINGS OF PACIFIC COAST ENTOMOLOGICAL SOCIETY 35

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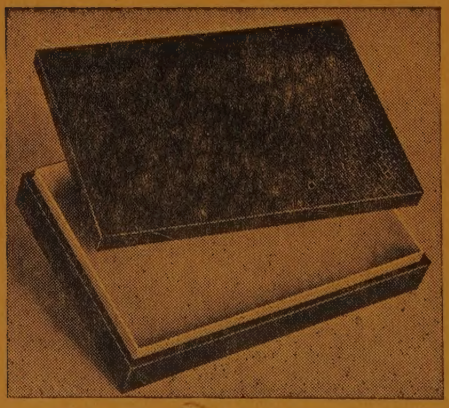

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POSSIBLE ECONOMIC RELATIONS OF THE HAWAIIAN INSECT FAUNA TO CALIFORNIA AGRICULTURE*

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The insect fauna of the Hawaiian Islands, both native and accumulated, is of direct interest and in some cases of serious concern to mainland agriculture, particularly to California which is the first mainland point of contact which grows commercially in her warm interior valleys or along the coast many of the host fruits or plants indigenous to the Islands.

Geographically as well as figuratively the Islands represent the last stepping-stone across the Pacific between the far East and the continental United States. For more than one hundred and fifty years they have been the focal point of nearly all trade routes travelled by surface ships moving to Pacific Coast ports from that vast area of the old world which includes Japan, Formosa, Eastern Asia, China, the Malay Peninsula, India, the Philippines, Australia, New Zealand and Oceania. More recently rapidly developing air transportation is closely following the same channels. Carriers over these routes have been and will continue to be the only means of transporting the myriad insect species representing known and potential plant pests in those areas to the Pacific Coast because natural spread is obviously precluded by the extended intervening water barriers.

It is not surprising, therefore, that over the years, in spite of quarantine safeguard measures which have been rigorously enforced during the latter part of that period, there may have accumulated in the Islands, as an addition to the local fauna an assortment of species which have not previously found it possible to complete the final and longer jump to the mainland.

Until very recently the 2,400 miles of water lying between the Islands and the mainland has, as just stated, proven a very effective barrier against natural spread. This natural safeguard has been further augmented by the limited number of available mainland ports of entry and the restriction of transportation due

* Presidential address read before the Pacific Coast Entomological Society on December 5, 1942.

to the long haul involved and to the small number of major carrier lines. All of these factors have combined to make the enforcement of prohibitory or restrictive plant quarantines practical.

The picture, however, is rapidly changing under the impetus of war conditions which are forcing advanced changes in transportation methods and materially increasing the number of trans-Pacific contacts with and via the Hawaiian Islands.

Whereas yesterday the fastest passenger ships took four and one-half days to traverse the distance between Honolulu and San Francisco and the slower freighters from five to eight days, passenger carrying planes with appreciable cargo space now make the same trip in as little as nine hours. Whereas arrivals averaged less than one a day they are rapidly approaching several daily. In one recent month as many passengers arrived by air as were carried by surface ships. And whereas ports of entry have been limited to the few natural harbors available to surface ships, air travel requirements have opened a wide vista of practical landing fields, whether for land or sea planes, throughout the entire length and breadth of the coastal area.

As already intimated the war situation itself has played an important part in this changing picture, forcing changes through necessity that might otherwise have taken a generation to develop. It has been responsible for materially increasing the hazards of introducing new pests through the medium of host fruits and plants carried in cargo, ships stores and quarters and in crew and passenger baggage. Ships and operating personnel have been diverted into the Hawaiian theater which have never been in those waters before and therefore are not familiar with the potential pest problems peculiar to that area. Air movements have made it possible to successfully transport field-ripened fruits which represent the optimum in host carriers. As a result more host plant material has been intercepted at coast ports and landing fields, with a higher ratio showing infestation, than at any time prior to December 7, 1941.

In view of this situation it seems worth-while to review some of the known economic insects established in the Islands which might, if introduced, prove equally important to California agriculture and to call attention to some of the little-known species which might become important if introduced into a new habitat. We shall also consider the potentialties of the means by which they might be introduced. In the present instance such a review is based on regulations directed against recognized pests

as covered in Federal(1)** and State(2) quarantines and on records of Hawaiian entomologists as reported in the Proceedings of the Hawaiian Entomological Society(3) and in the Annual Reports of the Hawaiian Agricultural Experiment Station(4). These sources of information have been supplemented by records covering an extensive list of insects(5) intercepted during the past ten years during the inspection of cargo, ships stores and quarters and passengers and crew baggage arriving at San Francisco from Hawaii.

Meriting first consideration in such a review are those species known to be seriously injurious to agriculture which are covered by specific quarantines, heading which is obviously the Mediterranean Fruit fly (*Ceratitis capitata* Wied.) common to a wide range of fruits, vegetables and fleshy seeds in the Islands. Possibly this insect is more commonly thought of in California as a potential pest of citrus because of the extensive publicity given to its attack on grapefruit during its brief occurrence in Florida. However, it offers promise of being a more serious pest of peaches and other closely related fruits. Knowledge of the ecological factors involved indicates that it could be of serious economic importance on such hosts if introduced into the warmer interior valleys or into the area along the coast from San Francisco south to the Mexican border.

Because of its wide range of hosts, the opportunities for the introduction of the Med-fly are probably greater than for any other insect. Except for the understanding cooperation of the carrier lines these hosts might be carried in quantity on every arrival from Hawaii. Fortunately, one of the incentives which has made many hosts attractive to the travelling public—their novelty—has been removed by extensive commercial plantings of similar fruits on the mainland. Also, some of the desire always prompted by prohibitions has been nullified by permitting preferred host fruits to move under certified origin treatment. Approved treatments consist of exposure to a temperature of 35° F. for fifteen days or 110° F. for eight hours or subjection to fumigation using methyl bromide. Host fruits may also move as frozen fruit at 20° F. Though any of these treatments is completely effective against all stages of the Med-fly, the effect on the host from the commercial standpoint has been such that their use seems to have proven practical only in the case of heat.

** Numbers in parentheses refer to bibliographic citations at the end of the paper.

However, there are many hosts not open to such treatments which are entirely unsuspected by the average traveler. Outstanding in this category is the fresh coffee berry. Its brilliant coloring makes it attractive as a souvenir and its novelty prompts tourists to attempt its propagation as an ornamental. Being a preferred host of the Med-fly and seldom encountered uninfested, it offers one of the most likely means of introduction. The fact that the Med-fly has not become established here during the thirty years which have elapsed since it first made its appearance in the Islands speaks well for the safeguard measures which have been carefully enforced during that period.

Deserving second consideration is the Melon fly (*Dacus cucurbitae* Coquillet) which is closely associated with the Med-fly in the Islands. It also attacks a wide range of fruits but more particularly fleshy vegetables and their above-ground stems. Its hosts include the balance of the fresh fruits and vegetables not included in the host range of the Med-fly, though there is of course some overlapping. Together these two insects could prove serious over a wide range of California's tremendous acreage of deciduous and sub-tropical fruits and over her equally large acreage of such vegetables as cucumbers, tomatoes, melons, thin-skinned squash, green beans and others. Hosts of the Melon Fly from Hawaii are most likely to be carried as ships stores and find their way ashore in refuse unless prevented by adequate inspections and other safeguard measures.

Considering other insects in their seeming order of importance, the pink boll worm (*Pectinophora gossypiella* Saund.) is also of outstanding importance. California's ability to consistently produce nearly twice as much cotton per acre, over her 500,000 acres, as the national average, is in part attributable to the absence of any real major pests of that host in the state. The pink boll worm is recognized as second to the Cotton boll weevil as such a pest and is common to cotton in the Islands. While not grown extensively there, some is grown commercially. Cotton bolls gathered as souvenirs and carried in passenger or crew baggage or used as supplementary packing in mail packages, particularly at Christmas time, as is not at all uncommon, are invariably found to carry larvae. In addition to attacking both cultivated and wild cotton, the pink boll worm is also recorded as attacking the seed of *Thespesia populnea* in Hawaii. This is a small tree common to the Islands of the Pacific, belonging in the Malvaceae and sometimes grown in moist warm places in Southern California as an ornamental.

In addition to the pink boll worm there are a number of potential pests reported as attacking the native wild cotton (*Gossypium tomentosum*) in Hawaii which might possibly adapt themselves to cultivated cotton if introduced to the mainland. None of these are included in Smith's list of insects attacking cotton in California (11). They include a weevil (*Rhyncogonus simplex* Perkins) whose larvae inhabit the soil and whose adults feed on the foliage; three species of plant bugs, *Ithamar hawaiiensis* Kirkaldy, *Nysius delectus* White, and *Nysius coenosolus* Stål., which are foliage feeders; a mealybug (*Pseudococcus filamentosus* Ckll.); a fulgorid (*Oliarus discrepans* Giffard); a thrips (*Taeniothrips hawaiiensis* Morgan); and the cotton blister mite (*Eriophyes gossypii* Banks). The pineapple mealybug (*Pseudococcus brevipes* Ckll.), commonly infesting nearly all Hawaiian pineapples received at mainland ports, is reported from cotton in the Islands.

While sweet potato production is not as extensive in California as in many other states, it is singularly free from serious insect pests and the acreage is sufficient to warrant an interest in those pests which might be introduced from Hawaii. Among the more important(11) are the larger sweet potato weevil (*Cylas formicarius* Fabr.) an introduced species; the smaller sweet potato weevil (*Cryptorhynchus batatae* Waterhouse) which is the common West Indian form and quite destructive at times, and a third species (*Euscepes postfasciatus* Favim), the adults and larvae of all of which bore into both the tubers and the above-ground stems; the sweet potato stem borer (*Omphisa anastomosalis* Güenee), a pyralid introduced into the Islands from China, whose common name describes its attack; the sweet potato leaf roller (*Phlyctaenia despecta* Butler) which is indigenous and which seriously skeletonizes the foliage; the sweet potato leaf miner (*Bedellia orchidella* Walsm.); and the sweet potato thrips (*Dendrothripoides impomeae* Bagnall). The latter is said not to be as injurious in the Islands as in other countries where it is present and is given credit for being predaceous on eggs of the sweet potato leaf miner. However, this complement of insects attacking every part of the plant would represent rather undesirable introductions into California and that possibility should be of concern to any commercial grower of sweet potatoes in the State. Fortunately a Federal quarantine prohibits the entry of sweet potatoes of Hawaiain origin or any parts of the plant at mainland ports. Possibility of introduction is, therefore, prac-

tically restricted to host material discarded as ship refuse against which adequate safeguards are already established.

McKenzie(9) records ten pests of avocado in the Hawaiian Islands, only one of which, the palm mealybug (*Pseudococcus nipae* Mask.), he records as occurring in California. That species is listed as a minor pest here. Included in those he lists as occurring in the Islands are, of course, the Med-fly as previously covered. Also included are the following: a coccid (*Aspidiotus persearum* Ckll.), an aleyrodid (*Aleurocanthus woglumi* Ashby), three *scolytids* (*Crossotarsus externedentatus* Favim, *Hypothenemus eruditus* Westw., and *Xyleborus immaturus* Blackb.), a tortricid (*Amorbia emigratella* Busck) and a xyloryctid (*Stenoma catenifer* Wlsm.). To this group might be added another scolytid (*Sinoxylon conigerum* Gerst.) which bores into and severs living twigs, and another coccid (*Fiorinia fioriniae* Targioni). The latter has been found heavily infesting fruit from the Islands on many occasions suggesting rather widespread distribution. Though present in California on palm, to a limited degree, it has never been taken on avocado within the State. Possibly the Hawaiian variety represents one of those strains within a species which has adapted itself to a specific host which would show the same preference if introduced to the mainland. It has been observed as being equally affected by the effective heat treatment under which Med-fly hosts are permitted to be brought into the State, all stages including the eggs seeming to be completely killed.

Present in the Islands and of particular interest to citrus growers are several species of coccids not found in California orchards. Most prominent among these is the coffee scale (*Coccus viridis* Green). It is one of the soft scales and was first reported from lemon in Fiji.(3) It is credited with destroying the coffee industry in Ceylon twenty to twenty-five years ago, and is reported as having a preference for orange second only to coffee. It seems to be quite widespread in the Islands where it is more or less of a general feeder. It might be introduced into mainland orchards on any one of a number of ornamentals such as gardenia, Panax, Plumeria, Fitchia and others. Its preference for gardenia is responsible for State regulations prohibiting the entry of flower leis from Hawaii when made from the flowers of that host. This scale is reported as being a heavy smut producer and difficult to control with oil emulsions. The other coccids referred to include *Parlatoria zizyphus* (Lucas) and *Unaspis yanonensis* (Kuw.) which are also common to citrus in

the Orient. The Japanese mealybug (*Pseudococcus krauhniae* Kuwana), of which a very restricted infestation on orange in the Ojai Valley in Ventura County was recorded some twenty-odd years ago, has been repeatedly intercepted from the Islands at Pacific Coast ports on *Jasminum* sp., gardenia and cacti. A white fly (*Aleyrodes giffardi* Kirk.), (8) representing an introduced species, occurs on citrus trees in and around the City of Honolulu.

In addition to the Melon fly, which is recorded as a serious pest of green beans in the Islands, there are two other serious pests of that host which, if introduced, could prove very costly to the growers of all types of beans which represent one of California's most valuable dry farm crops, and also to growers of green peas. One is a pyralid commonly known as the bean pod borer (*Maruca testulalis* Geyer) (4) which is recorded as seriously damaging both limas and string beans in the Islands as well as green peas. Of more or less widespread distribution throughout the tropic and sub-tropic zones, this species is considered to be of sufficient importance to be the subject of Federal quarantines restricting the movement of its hosts from Puerto Rico to the eastern seaboard. More recently it has been repeatedly intercepted in similar hosts entering the United States from Mexico at Mexican border ports, though fortunately moving east rather than into California. This species is sometimes responsible for damage credited to a lycaenid (*Cosmolyce boetica* Linn.), the second of the two serious pests referred to. This species is commonly called the bean butterfly. Its larvae are a serious pest of green beans, destroying the flowers as well as attacking the pods. Both of these species are commonly intercepted on the so-called Mauna loa flower leis (*Dioclea violacea*), one of the most popular types worn or carried by passengers returning from the Islands. For that reason such leis are prohibited entry into California by State regulations(2). Another insect species of economic importance to beans in the Islands is a jassid (*Empoasca solana* DeLong), which is credited with destroying plants on occasion. The adults and nymphs feed on the under sides of the leaves and are responsible for what is termed "hopper burn." In addition to beans it attacks lettuce, potato and celery among other hosts. However, the number one pest of green beans in Hawaii is considered the Oriental rose beetle (*Adoretus sinicus* Burm.) (4), a scarabiid whose larvae feed on the roots in the soil and whose adults, when abundant, often completely skeletonize the leaves.

California has just completed the 1942 tomato season with a

record of 781,000 tons canned—one-fourth of the total national canned production. While several important insect pests of this host already are present in the State, such as the tomato pin worm, and corn earworm, and more recently the tomato russet mite, there are several pests of tomato in the Islands which could add considerably to the total damage from insect attack, if introduced. Among those of major importance are the Med-fly and the melon fly previously mentioned under other hosts. Of lesser importance are the so-called Mexican leaf roller (*Amorbia emigratella* Busck), which also attacks broccoli and potato and has been included under potential pests of the avocado; and a gall midge (*Contarinia solani* Riibsaamen), which is partly responsible for the heavy blossom drop experienced in some districts.

There are a number of miscellaneous insect pests of green vegetables present in the Islands in addition to the Melon fly or to those just mentioned as attacking green beans and peas, any one of which might prove of economic importance if established in any part of the extensive truck crop acreage in California. Among those of seeming importance are a thrips (*Taeniothrips alliorium* Priesner) attacking onions. This was originally described by Moulton as *T. carteri* but later corrected to *alliorum* on comparison with specimens from Japan; *Taeniothrips hawaiiensis* (Morg.), a general feeder in the Islands which is reported as damaging asparagus; and a plant bug (*Nysius nemorivagus* White) recorded as attacking cucumbers and as causing silver wilt to terminal shoots of Irish potato. Of the hosts mentioned, asparagus and cucumbers have been offered for entry under the heat treatment for Melon and Med-fly which seems to be effective against many other insects. Potatoes and onions may be brought in under Federal certified inspection though few, if any, of the latter have been offered.

Ornamentals brought in as rooted plants, admissible only without soil, but more often as cuttings, offer a more widespread opportunity of introducing particularly new species of scale insects and mealybugs, and, as propagative material for planting, present a more certain means of their establishment if not intercepted. A single handful of miscellaneous cuttings brought back by a visitor to the Islands for planting in California merely "because they were pretty" when seen blooming in the Islands was found to carry as many as seven species of scale insects not known to occur in California. Any one of these species might find a more preferred host of economic importance on the mainland, or turn out to be a general feeder comparable to the olive

scale (*Parlatoria oleae* Colvé) which has recently attained economic importance in Central California. Among those which might be introduced from Hawaii are *Lepidosaphes tokionis* Kuwana on croton, orchids or strelitzia; *Phenacaspis eugeniae* var *sandwichensis* (Full.) and *Ripersia palmarum* (Ehrh.) on sprouted coconuts; *Ceroplastes rubens* (Mask.) and *Lepidosaphes uniloba* (Kuwana) on Maiele; *Lepidosaphes pallida* (Green) on juniper; *Coccus acuminatus* (Sign.), *Coccus viridis* (Green) and *Protopulvinaria pyriformis* (Ckll.) on gardenia; *Pseudaonidia clavigera* (Ckll.), *Pseudaonidia tesserata* (deCharm), *Morganella longispinae* (Morg.) and *Asterolecanium pustulans* (Ckll.) on hibiscus; *Pinnaspis buxi* (Bouché) on strelitzia; *Odonaspis secreta* (Ckll.) and *Antonina bambusae* (Maskell) on bamboo; *Leucaspis cockerelli* (Green) on cacti; *Tylococcus giffardi* (Ehrhorn) on pandanus; *Aonidiella inornata* (McKenzie) on betel palm and pikake; and *Pulvinaria psidii* (Maskell) on *Jasmimum* spp. Among the mealybugs which might be introduced on ornamentals are *Pseudococcus filamentosus* (Ckll.) on *Areca sp.*, *Pseudococcus virgatus* (Ckll.) on betel palm and *Pseudococcus krauhniae* (Kuwana) on *Jasmium*, gardenia or cacti. Undoubtedly, there are many other coccids which might be included but those cited represent actual interceptions made at Pacific Coast ports on the hosts given, which hosts were intended for planting in various localities in California.

Our recent experience with the rapid spread of the gladiolus thrips (*Taeniothrips simplex* Morr.) and the extensive damage resulting from its attack on commercial, as well as private, gladioli plantings should make us rather thrips conscious as far as new additions to our already extensive State fauna is concerned. From that standpoint there are several species present in the Islands which might prove destructive if introduced and established. *Haplothrips gowdeyi* (Frank.) has a high population density and a wide range of hosts. It is normally a flower feeder but often attacks the foliage. *Taeniothrips hawaiiensis* (Morgan) is a general feeder on Leguminoseae and Convolvulaceae. In addition to cotton and asparagus, as previously mentioned, it also attacks alfalfa. *Taeniothrips alliorium* (Priesner) has already been mentioned as attacking onions. *Selenothrips rubrocinctus* (Giard.) is reported as seriously damaging guava and plum causing a silvering of foliage and a cracking of the fruit. *Thrips panicus* (Moulton) is reported on rice.

Speaking of rice, which is an important crop in California, one of the major insect pests of this host in Hawaii and in the

Orient from which it was introduced into Hawaii, is the rice stem borer (*Chilo simplex* Butl.). Infestation in the Islands is heavy and the damage often severe. It also attacks corn, wheat and sugar cane. Over-wintering larvae are eeasily carried in rice straw which was generally used as packing for bananas up to 1928. At that time it was discontinued because of this insect, being replaced with banana leaves. Rice straw is still used as packing for fragile merchandise and must be carefully watched for and removed when found.

Due to the Federal prohibition against soil associated with plant material(1) there seems to be little danger of introducing the Oriental rose beetle (*Adoretus sinicus* Burm.) or the Oriental beetle (*Anomala orientalis* Waterhouse) common to the Islands, whose larvae are normally found in that medium. Both are Scarabaeids, the latter being somewhat similar in habits and life history to the Japanese beetle (*Popillia japonica* Newm.).

Flower leis have long been looked on with suspicion as potential carriers of a wide range of insects either as hosts or as transients(2). The introduction hazards in this respect have been greatly increased by overnight air transportation. During a recent survey made by the author, forty-one species of insects, over half of which are more or less of economic importance, were taken on twelve different types of leis. In the final analysis the so-called Mauna loa was prohibited as a host of the bean pod borer (*Maruca testulalis* Geyer) and the bean butterfly (*Cosmolyce boeticus* L.), bougainvillea as a host of the bean butterfly and gardenia as a host of the coffee scale (*Coccus viridis* Green). The balance are being disregarded as not of sufficient importance, or as not liable to introduction through the means of such carriers.

While the foregoing list of economic or potentially economic insect species which might be introduced into California from Hawaii is far from complete, it is sufficiently comprehensive to emphasize the importance of exercising adequate safeguard measures against such possibilities. In that respect they offer considerable food for thought, particularly in view of the changing conditions favorable to the transportation of their hosts as discussed in the opening paragraphs of this paper. While prohibiting the entry of their hosts may have been effective up to now, the development of effective means of disinfection supports the present trend toward approved movement under supervised origin treatment. The latter approach merits serious consideration from the standpoint of the gradually widening field of entry

under air transportation which it will be increasingly difficult to cover in the future by prompt inspections at destination.

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RECORDS AND DESCRIPTIONS IN THE MEGACHILID SUBGENUS ARGYROPILE

(Hymenoptera, Megachilidae)[1]

BY THEODORE B. MITCHELL
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Four species of *Megachile* have been included in the subgenus *Argyropile*, *parallela* (the genotype), *townsendiana*, *nebraskana* and *sabinensis*. Both *parallela* and *townsendiana* are known in both sexes and the close affinity of the two has been established, but the others are known only in the female sex and their relationship to the first two species is not so clearly evident. Recently two more species have been discovered which seem to be related to members of this group. However, since the males of these also are not known, their inclusion in the subgenus is open to question, just as with *nebraskana* and *sabinensis*, and a positive opinion concerning their affinities will not be justified until the males have been discovered. Descriptions of these two species, as well as new locality records for the other species of *Argyropile* follow. This group of species may be separated from the other subgeneric groups by use of the key to subgenera of *Megachile* (Trans. Am. Ent. Soc. LIX, p. 306, 1934), and the subgeneric characters are given in Part VI of the Revision of Megachile (Trans. Am. Ent. Soc. LXIII, p. 46, 1937).

MEGACHILE (ARGYROPILE) PARALLELA Smith

This species apparently has not been recorded previously from the states in the following list of records.

Arkansas: 1 ♀, Eureka Springs, Ouachita Mountains, September 4, 1939 (E. C. Van Dyke). Georgia: 1 ♀, Perry, August 12, 1939 (E. G. Wegenek). Iowa: 1 ♀, Sioux City (C. W. Ainslie). Mexico: 1 ♂, 1 ♀, Torreon, Chir., June 17, 1937 (Mead); 1 ♀, Estrella District, Alamos, Sonora, October 2, 1933 (R. M. and G. E. Bohart). Missouri: 1 ♂, 8 ♀, Branson, September 9-17, 1937; 8 ♀, Ozark Lake, September 23-24, 1939 (both E. C. Van Dyke). Oklahoma: 1 ♀, Strang, June 18, 1939; 1 ♂, Tahlequah, June 17, 1939 (Kaiser-Nailon).

[1] Research Contribution No. 16, published with the aid of the State College Research Fund, Department of Zoology, North Carolina State College of Agriculture and Engineering of the University of North Carolina.

MEGACHILE (ARGYROPILE) TOWNSENDIANA Cockerell

Since this species, which was described from Arizona, has been recorded previously from only one eastern locality, Miami, Florida, the Florida and North Carolina records in the following list are of especial interest.

Arizona: 1 ♀, Continental, July 15, 1940 (E. E. Kenaga); 1 ♂, 1 ♀, Tombstone, August 13, 1940 (E. S. Ross). California: 1 ♂, Imperial County, June, 1912 (J. C. Bridwell). Florida: 1 ♀, St. Augustine, October 12, 1929 (H. T. Fernald). New Mexico: 1 ♀, Santa Rosa, June 23, 1940 (E. E. Kenaga). North Carolina: 2 ♂, mouth of Cape Fear River, July 25, 1941 (T. B. Mitchell). Texas: 1 ♀, Austin, April 27, 1902; 1 ♀, Galveston, June, 1900 (both A. L. Melander); 1 ♀, College Station, May 30, 1938; 1 ♂, El Paso, August 18, 1908 (F. C. Pratt).

MEGACHILE (ARGYROPILE) NEBRASKANA Mitchell

Colorado: 1 ♀, Hygene, July 11, 1936. Nebraska: 1 ♀, Harrison, July 18, 1936 (J. Player). Wyoming: 12 ♀, Wheatland, July 14, 1937 (R. H. Beamer).

MEGACHILE (ARGYROPILE) SABINENSIS Mitchell

Arizona: 1 ♀, 10 miles west of Bisbee, August 10, 1940; 1 ♀, Turner, August 9, 1940; 1 ♀, 10 miles east of Douglas, August 11, 1940 (all E. S. Ross); 1 ♀, Texas Canyon, Chiricahua Mountains, Cochise County, 5000-6000 feet, September 16, 1927 (J. A. Kusche). Texas: 1 ♀, Alpine, June 10, 1930 (E. G. Linsley); 1 ♀, Sanderson, June 10, 1930 (J. O. Martin); 1 ♀, Sheffield, June 14, 1940 (T. B. Mitchell).

Megachile (Argyropile) asterae Mitchell, new species

This species is nearest to *M. nebraskana* and *M. sabinensis*. The rather coarsely rugoso-punctate surface of the vertex and mesonotum will readily serve to separate it from *nebraskana*, while in *sabinensis* there is a minute median denticle on the clypeal margin which is lacking in *asterae*, and the puncturation in general is finer and more definitely separated in *sabinensis* than in this new species.

Female. Size: Length, 15 mm.; breadth of abdomen, 5 mm.; anterior wing, 10 mm.

Structure: Face slightly broader than long, eyes parallel; clypeal margin with a short incurved area medially, the rim of which

is impunctate; mandible 4-dentate, a cutting edge between third and fourth teeth; second joint of flagellum subequal to pedicel, shorter than first joint; lateral ocelli very slightly nearer eyes than to edge of vertex, the vertex broad and flat, its margin nearly straight; cheeks broader than eyes; mid and hind metatarsi equalling their tibiae in length and nearly so in width, the anterior and posterior apical angles of mid-tarsal joints produced, but not spine-like as in *parallela*; apical margin of fourth and fifth abdominal terga depressed, that of the third only laterally; sixth tergum straight in profile, with a few basal erect hairs visible at that angle; sixth sternum largely bare over apical half, the rim reflexed, thickened or "rolled" (as in *nebraskana*).

Puncturation: Shallow on clypeus, rather coarse and irregular medially, becoming very fine, close and indistinct laterally and above; supraclypeal area with a few relatively coarse close punctures, otherwise they are minute and densely crowded; very fine and close on cheeks; more coarse and deep, but crowded over entire vertex; crowded over entire thorax, rather coarse on mesonotum medially and on pleura below, otherwise about as fine as on vertex; very fine and close on abdomen basally, becoming more deep and distinct to fifth tergum, separated by more than their width on apical portion of disc on this segment, fine and crowded over entire sixth tergum.

Color: Black; tegulae and spurs ferruginous; wing nervures black or piceous, the wing lightly infuscated, more so apically.

Pubescence: Whitish on head, thorax and legs, some dark hairs intermixed on vertex and mesonotum, hairs covering outer surface of mid metatarsi more yellowish; white on basal segment of abdomen and on basal portions of discs of second and third terga, these with dark pubescence apically and fourth and fifth covered with dark hairs, the sixth with some dark basal hairs laterally, intermixed with whitish suberect hairs, the apical half covered with pale tomentum, this becoming brownish at tip; segments 1-5 with entire white apical fasciae, these rather thin on first and second segments; scopa white, with no dark hairs at all evident, that on sixth sternum more brownish.

Type, female, No. 5233, California Academy of Sciences, Ent., KAIBAB FOREST, UTAH, September 21, 1938 (I. McCracken, on blue *Aster*).

Megachile (Argyropile) rossi Mitchell, new species

The following characters will serve to distinguish this apparently distinct form from *M. parallela* Smith, its nearest ally: the sixth tergum is definitely concave in profile; the clypeal margin lacks the median tubercle characteristic of *parallela*, being represented by the merest trace; the clypeal punctures are considerably finer than in *parallela*; and the apical posterior

angles of the mid tarsal segments are not produced as in *parallela*, although the anterior apical angles are much elongated. In other structural details, and in puncturation and pubescence, little if any difference in comparison with *parallela* can be detected. Positive proof that this is a distinct species, rather than a marked variant of *parallela*, awaits the discovery of the male and the collection of a considerable series of females.

Female. Size: Length, 15 mm.; breadth of abdomen, 4.3 mm.; anterior wing, 9.5 mm.

Structure: Face distinctly broader than long; eyes slightly convergent below; median half of clypeal margin with a polished impunctate rim in the center of which is a bare trace of a denticle; mandible 4-dentate, third tooth acute, about mid way between inner and outer teeth; apical joint of antenna longer than the others which are about equal to each other, the basal joint not quite twice the length of the pedicel; lateral ocelli subequally distant from eyes and edge of vertex, very slightly nearer to each other; vertex rather flat, hind margin nearly straight; joints of mid tarsi with anterior apical angles produced into slender finger-like projections, the posterior angles very short; hind metatarsi very broad and long, not quite twice the length of the remaining joints combined; segments 2-4 of abdomen with rather deep transverse basal grooves, apical margins of segments 3-5 deeply depressed, that of segment 2 depressed only toward sides; sixth tergum slightly but distinctly concave in profile, showing no erect hairs; apical bare rim of sixth sternum but very slightly reflexed.

Puncturation: Rather fine and sparse on the polished clypeus, more close on the cheeks and upper face, becoming minute and crowded on cheeks above, more coarse and distinctly separated on vertex where the surface is tessellated; close and rather fine on scutellum and on mesonotum laterally, distinctly separated medially, the surface tessellated, the pleura more coarsely rugoso-punctate; close and fine on abdomen basally, becoming more distinct apically, sparse and rather coarse toward the apical depressed margin of segment 5, fine close and distinct on segment 6.

Color: Black; wings subhyaline; tegulae and wing nervures ferruginous; spurs yellow.

Pubescence: Entirely white; short and thin on vertex and mesonotum, very short on discs of segments 3-6 of abdomen, longer and more dense at sides of face, on cheeks below, on pleura, propodeum and basal segments of abdomen; scutello-mesothoracic suture white fasciate, and a dense white fringe above tegulae; abdominal segments white fasciate, but the more apical ones obscured (due apparently to condition of the specimen), sixth tergum largely covered with silvery appressed tomentum becoming brownish toward the tip; scopa white, with no dark hairs in evidence.

Type, female, No. 5234, California Academy of Sciences, Ent., TOMBSTONE, ARIZONA, August 13, 1940 (E. S. Ross). Paratype: 1 female, 10 miles west of DOUGLAS, ARIZONA, August 11, 1940 (E. S. Ross).

The following key separates the females of all of the species and varieties that have been placed in *Argyropile* up to this time. One of these, *flavihirsuta* Mitchell, is Mexican, and has not been found north of the Mexican border.

KEY TO FEMALES OF ARGYROPILE

1. Sixth tergum distinctly concave in profile, covered with short, dense, appressed tomentum 2
–. Sixth tergum straight in profile 3
2. Apical rim of sixth sternum reflexed sharply upward; clypeal margin with a minute but distinct median denticle; punctures of clypeus close and rather coarse ..... *townsendiana*
–. Apical rim of sixth sternum not reflexed upward; median denticle of clypeal margin reduced to the barest trace; punctures of clypeus rather sparse, the surface shining ..... *rossi*
3. Clypeal margin with at least a slight median denticle 4
–. Clypeal margin with no trace of a median denticle 8
4. Inner angle of mandible incised, resulting in a 5-dentate condition; pubescence entirely bright fulvous ..... *flavihirsuta*
–. Mandible distinctly 4-dentate, the inner angle acute 5
5. Apical rim of sixth sternum reduced, sharply reflexed, not at all protuberant; punctures of clypeus very close; pubescence of sixth tergum subappressed, not densely tomentose ..... *sabinensis*
–. Apical rim of sixth sternum protuberant; clypeus shining, the punctures well separated; sixth tergum densely pale tomentose medially and apically 6
6. Scopa on sixth sternum black ..... *parallela* var. *reta*
–. Scopa entirely pale 7
7. Lateral ocelli slightly nearer edge of vertex than to eyes ..... *parallela* var. *tulariana*
–. Lateral ocelli equidistant from eyes and edge of vertex ..... *parallela*
8. Apical margin of clypeus straight medially, clypeal punctures well separated, the surface shining; mesonotum tessellated, with sparse and very minute punctures ..... *nebraskana*
–. Clypeal margin incurved medially, the surface densely and irregularly punctate, dull; vertex and dorsum of thorax very densely punctate throughout ..... *asterae*

NEW SPECIES AND SUBSPECIES OF NORTH AMERICAN CARABIDAE

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During the last few years, quite a number of species of Carabidae have been received which have been found to be new. These are now described and at the same time a few notes made concerning others.

Calosoma lariversi Van Dyke, new species

Rather small, short, black, smooth and shining. Head: smooth, at most with a few fine punctures and minute wrinkles, frontal impressions well marked; eyes only moderately convex; mandibles feebly striate and punctate; antennae with first five segments glabrous, the following more or less smooth on upper and lower faces, elsewhere finely pubescent. Prothorax relatively small, three-fifths as long as broad and about two-fifths broader than head, emarginate in front with anterior angles narrowly rounded, front margined and with elevated beading which is sometimes bleached or rufous, sides moderately arcuate in front, gradually narrowing and oblique behind middle, side margin well beaded, hind angles subangulate and extending backward to a moderate degree, the base feebly emarginate and sometimes finely margined laterally; disk slightly convex, almost smooth, with median longitudinal line finely impressed, lateral sulcus gradually broader posteriorly and rather coarsely punctured as is to a slight degree the area in front of basal margin. Wingless, elytra cordiform, humeral angles broadly rounded, sides moderately arcuate and gradually narrowing posteriorly to subacute apex, side margin narrow and well reflexed; disk quite convex and fairly smooth in front with striae finely and obscurely impressed and finely punctured, the apical area and declivity sometimes more coarsely sculptured, finely or even coarsely scabrous or rugose. Length 13-15 mm., breadth 6-8 mm.

Males with first three tarsal segments on front feet broadly dilated and papillose beneath.

Holotype, male, allotype, female (Nos. 5294 and 5295, C. A. S., Ent.) and four paratypes, all collected in an isolated locality near Lamoille, Nevada, June 25, 1941, by Mr. Ira La Rivers. The paratypes will all be returned to Mr. La Rivers, after whom I take great pleasure in naming this fine species.

The species superficially looks very much like smaller specimens of *Calosoma latipenne* Horn because of its more or less smooth and shining appearance. It is, however, quite distinct, having eyes that are far less convex, not prominent as in *lati-*

penne; a prothorax that is proportionately smaller, with sides almost straight and oblique behind, the hind angles subacute and projecting well posteriorly, not broadly rounded and feebly projecting, the disk not broadly deplanate toward hind angles and with the head quite smooth, not more or less coarsely punctured and rugose as is generally the case in the other; and the elytra without serrations at the humeral margin. It is really more closely related to *luxatum* Say, sharing with that species and its variations the less convex eyes and less prominent hind prothoracic angles. Its distribution also lends support to that relationship.

In this connection, I wish to state that our wingless, stubby species of *Calosoma* do not belong at all in the Old World genus *Callisthenes*. The latter are in general more powerfully constructed, with large heads, a large prothorax, robust legs and with the outer segments of the antennae uniformly pubescent. I believe that our species are derived entirely from American stock, originating as offshoots from certain West American *Calosoma*. Some of these may later have to be placed in new subgenera but that should not be done until the entire group is carefully revised.

Calosoma zimmermanni tahoensis Van Dyke, new subspecies

Rather small and more or less gracefully formed, black, feebly shining. Head rugose, punctate, with eyes moderately convex, not hemispherical and projecting, frontal impressions distinct, antennae with outer segments more or less smooth on upper and lower faces. Prothorax rather small, 4.5-5 mm. wide, three-fifths as long as broad, two-fifths broader than head, apex emarginate, distinctly margined and with beading smooth, sides moderately arcuate in front, straight or feebly sinuate posteriorly and converging, side margin narrowly reflexed, hind angles sharply rounded and distinctly projecting beyond the almost straight basal margin; disk feebly convex, punctate, rugose, with median line finely impressed and apex and base finely and distinctly margined. Elytra elliptical, one-fourth longer than broad, humeral angles broadly rounded, sides arcuate, side margin narrowly reflexed; disk feebly convex, stria well defined and with intervals well elevated and more or less regularly interrupted to form rows of somewhat elongate tubercles. Length 13-14 mm., breadth 6-7 mm.

Males with first three tarsal segments of front feet broadly dilated and papillose. Females generally larger than males.

Holotype, male, allotype, female (Nos. 5296 and 5297, C. A. S., Ent.) and numerous designated paratypes from a series of forty-one specimens in the collection of the California Academy of Sciences. The holotype was collected by me high up on

the slopes of Mt. Tallac, near Lake Tahoe, California, during June, 1899. The allotype was also collected by me, but near Fallen Leaf Lake, July 27, 1915. Most of the other specimens were also collected in the Lake Tahoe region at the higher altitudes such as the slopes of Mt. Tallac, Heather Lake, Glen Alpine (Blaisdell, Van Dyke, Fenyes), Summit (Koebele), but other specimens from high altitudes in other parts of the Sierra Nevada mountains were also found to be of the typical pygmy type, *e.g.*, one from Donahue Pass, Yosemite National Park (V. Duran), two from Cow Creek, Tuolumne County (Van Dyke), and one from Mammouth, Mono County (Ross).

This subspecies is a pygmy phase of *zimmermani* which is only found at high altitudes in the middle Sierras. Most specimens have been taken in the Lake Tahoe region. It closely resembles in sculpture some of the more typical *zimmermani* from farther north such as those of the Mount Shasta region. These are of course larger and more robust, also have the head and pronotum more coarsely sculptured, rugose-sinuose, and the elytral tubercles more scale-like. The relatives found in the gold belt or foothill region to the west of Lake Tahoe have an entirely different type of sculpturing which places them as *exaratus* Csy. while those found in the Great Basin to the east, as at Verdi, Reno and Winnemucca, Nevada, are more definitely striate with the intervals less interrupted, the *monticola* of Casey.

Nebria coloradensis Van Dyke, new species

Large, robust, black, the elytra metallic and of a deep violet color, almost black, two spots on front, outer segments of antennae, tarsi and median portion of body beneath somewhat rufous. Head three-fourths breadth of prothorax, eyes moderately convex and prominent, antennae long and delicate, extending beyond middle of elytra, the frontal impressions flattening out laterally into feebly rugose triangular areas. Prothorax slightly less than three-fourths as long as broad, four-fifths as broad as elytra, apex feebly bi-sinuate at middle and with anterior angles sharply rounded and extending forward; sides broadly arcuate in front, sinuate posteriorly and straight and parallel to base, forming right-angled hind angles, the reflexed margin fairly wide, of even width, and more acutely elevated posteriorly, base feebly bi-emarginate; disk moderately convex and smooth, the median longitudinal line rather finely and feebly impressed, anterior and posterior transverse impressions rather deep, the anterior and basal areas punctate, rugose. Scutellum smooth and arcuate posteriorly. Elytra elongate-elliptical, about three times as long as prothorax and four-ninths longer than broad, humeri not prominent, the humeral angles arcuate, sides almost straight or very feebly arcuate and gradually

diverging to posterior third, thence rounded to apex; the disk slightly convex, flattened at middle, the striae finely and rather deeply impressed and very finely, closely punctured, intervals definitely convex, narrowed and crowded near base, broader and flatter behind, the third and seventh irregularly interrupted and catenate behind, the ninth interrupted throughout, the lateral margin finely reflexed. Legs long and delicate. Length 14 mm., breadth 5.5 mm.

Holotype, male (No. 5298, C. A. S., Ent.), a unique collected by myself near the Twin Lakes, Lake County, Colorado, June 28, 1935.

This feebly metallic species belongs very near *metallica* Fisch. It is, however, longer, proportionately narrower as regards head, prothorax and elytra, the prothorax more gradually narrowed behind, the elytra definitely elliptical, not square shouldered, and the intervals as the result of the narrowed basal area narrower, more convex and crowded together toward the base, the striae also more evidently impressed. This species, though more robust, also has somewhat the facies of *purpurata* Lec. but its prothorax is larger and broader and the elytra more elliptical, less narrowed and spatulate than in *purpurata*.

Nebria zioni Van Dyke, new species

Elongate, somewhat narrow, brown, head, prothorax, epipleurae and often elytral suture more or less rufous, antennae, palpi and legs testaceous, the elytra generally with a feeble, metallic green lustre. Head about one-third breadth of prothorax, eyes moderately convex, antennae long and delicate, extending to middle of elytra, the two rufous frontal spots generally coalescent or the entire forehead rufous. Prothorax two-thirds as long as broad, three-fourths as broad as elytra, apex feebly bi-emarginate, apical angles sharply rounded and extending well forward, sides arcuate in front, narrowing posteriorly, sinuate well in front of hind angles and parallel to base forming prominent right-angled hind angles, very acute at apex, base feebly bi-emarginate; disk convex, anterior transverse impression feebly to well impressed, the posterior transverse and basal impressions deep and more or less punctured, the lateral margin rather wide, broader near hind angles and with a narrow reflexed margin. Elytra elongate-elliptical, or feebly spatulate, three times as long as prothorax, two-thirds as broad as long; the disk slightly convex, stria deeply impressed and very finely, closely punctured, the intervals entire and narrowed and crowded toward base, broader posteriorly, several small punctures in third interval and generally near third stria, the humeral angles obliquely rounded, lateral margins narrowly reflexed. Legs long and delicate. Length 10 mm., breadth 4 mm.

Holotype, male, allotype, female (Nos. 5299 and 5300, C. A. S., Ent.), and several designated paratypes from a series of twenty-one specimens, nineteen collected in the canyon of Zion National Park, Utah, by myself on May 29, 1935, and two collected in the same area by Dr. A. M. Woodbury.

This species is very similar to *Nebria eschscholtzi* Mén. and probably derived from the same stock. It differs from it by being generally narrower, the prothorax narrower, the sides sinuate farther forward in front of the hind angles and the hind angles themselves more prominent; and the elytra elliptical or feebly spatulate, with the base much narrowed, the humeral area reduced, the elytral intervals much narrowed and crowded at base, and the elytra themselves with a feeble yet definite metallic lustre. The true wings are so much reduced or aborted that they are less than half the length of those in normal *eschscholtzi* which themselves are considerably aborted and the result of this is indicated in the basal area of the elytra which are very much narrowed as compared with those in the other species.

Nebria eschscholtzi Mén. is a species found commonly along the streams flowing into the Pacific ocean from Alaska to southern California but except in the north where it follows the branches of the Columbia and other streams inland, it does not extend much east of the Cascades or Sierra Nevada mountains. I have seen a typical specimen from Pyramid Lake, Nevada, a remnant of the ancient Lake La Hontine, which formerly had an outlet to the northwest, but I have seen no true *eschscholtzi* from the southern part of the Great Basin. The ancestors of *Nebria zioni* were probably isolated and left as relicts as a result of the gradual drying up of most of this inter-mountain region and their physical degenerative processes accelerated.

Pasimachus velutinus Van Dyke, new species

Large, robust, black, the males shining, the females dull or opaque and generally with a feeble violaceous tint to pronotum, the elytra smooth or even, without sulci or striae. Head large, front smooth or feebly wrinkled, especially forwards in females, frontal impressions deep, eyes large but feebly convex, antennae robust, extending beyond middle of prothorax, segments 2-4 not carinate, feebly compressed toward base at most, labrum broadly and feebly trilobed, conspicuously strigate, mandibles robust and strigate. Prothorax robust, apex broadly emarginate, apical angles subacute and slightly produced forwards, sides broadly arcuate from apical angles to close to base, then narrowed and sinuate to small, feebly everted, acute angles, the base broadly emarginate,

basal marginal line fine and deep; disk slightly convex, almost smooth, median longitudinal line finely impressed, anterior transverse impression in general poorly defined, posterior transverse impression quite evident in the male, vague in females. Elytra cordiform, humeral area broadly rounded, sides slightly arcuate and narrowed and oblique to subacute apex, margins finely reflexed, humeral carina very short but with a small tooth at its base on the margin; disk evenly arched and smooth, the general surface as also of head and pronotum minutely alutaceous under high power of magnification, a double row of minute punctures can sometimes be seen, surface shining in males and dull in females. Legs quite robust, spine of middle tibiae slender and acute, hind tibiae of males not densely pubescent on inner side and tarsi long and slender. Beneath more or less smooth and shining. Length 35 mm., breadth, 13 mm.

Holotype, male, allotype, female (Nos. 5301 and 5302, C. A. S., Ent.) and five female paratypes, the holotype collected at Venedio, Sinaloa, Mexico, July 23, 1918, by J. August Kusche; the allotype at the same locality, June 28, 1918, four paratypes also collected at Venedio while the fifth was taken at San Bernardino, Rio Mayo. Sonora, Mexico, July 15, 1935, by H. S. Gentry.

This fine species might at first sight be confused with *Pasimachus californicus* Chd. It is in general somewhat longer, the males and females differ in appearance to a greater degree, and it has the distinctive characters such as the non-carinate basal segments of the antennae and the non-pubescent inner surface of the male hind tibiae. I cannot find any other species listed from Mexico other than *californicus* that at all resembles it and it differs greatly from any of those found in our own country.

Dyschirius arizonicus Van Dyke, new species

Medium sized, narrow and elongate, entirely rufous to rufotestaceous. Head smooth with an inverted V-shaped impression between antennae, clypeus tridentate with median tooth prominent. Prothorax globose, smooth and shining, median longitudinal line finely impressed and anterior transverse impression distinct. Elytra elongate, base subtransverse and with basal striae distinct, humeral angles well rounded, all striae present and complete, well impressed and finely punctured to posterior third, third interval tripunctate. Anterior tibiae not dentate. Length 3 mm., breadth 1.25 mm.

Holotype (No. 5303, C. A. S., Ent.) and five paratypes collected at Holbrook, Arizona, and coming to me from the C. W. Leng collection.

This rufous species, in size, color and general appearance, looks very much like *Dyschirius salivagans* Lec. but the margined base of elytra and tripunctate elytral intervals separate it widely. The well marked tridentate clypeus would place it very close to *Dyschirius tridentatus* Lec.

Feronia (Feronina) humidula Van Dyke, new name

In January, 1926, I described a new species of *Feronia* as *Pterostichus pacificus* (Pan-Pacif. Ent., II, No. 3, p. 114). The specific name, I find, is preoccupied by *P. pacificus* Poppius (Acta. Soc. Fauna Flora Fenn., XXVIII, 1906, nr. 5, pp. 25, 184). I therefore take this opportunity to change the name of my species to *humidula* Van Dyke. The generic name *Pterostichus* Bon. will also have to be replaced by *Feronia* Latr. for, according to H. E. Andrewes, an authority on the Carabidae, Bonelli never properly published the description of the genus, merely sending a leaflet with the description to a few friends. The species of Poppius is in the subgenus *Cryobius*. I formerly placed my species in that subgenus but I find upon reexamination and with the help of additional specimens, that it does not belong there but in the subgenus *Feronina* Csy. along with *lanei* Van Dyke, described at the same time. As a result, I find that there are three species in the subgenus and their distribution is interesting in that it corresponds with the three relict tertiary faunas of northern origin in North America: the Vancouveran, the Idahoan and the Alleghaenian. I have defined these in various papers, the first published in 1919 (Ann. Ent. Soc. Am., XII, pp. 1-12, 1919). The following synopsis will aid in the separation of the members of the subgenus *Feronina*.

Synopsis of the Species of Feronina

1. Larger species, 11 mm. or over in length, black or dark castaneous (immature), elytra about twice as long as broad.....2
–. Smaller species, 8-9 mm. long, piceous to black, legs quite rufous, elytra barely a third longer than broad; eyes moderately convex; sides of prothorax arcuate in front, sinuate behind and straight and parallel for a short distance to the right-angled hind angles, the basal impressions broad and deep and more or less coarsely punctured; elytral intervals somewhat flattened. Prosternum rounded and deflexed at apex, not margined. Grays Harbor, Wash. (type, Hoquim) and northern Coast of Oregon, Cannon Beach and Columbia County..... .....*humidula* Van Dyke

2. Eyes not prominent, feebly convex; sides of prothorax arcuate in front and straight or feebly sinuate and convergent to obtuse-angled hind angles, basal impressions sharply linear and lunate, without punctures; elytral intervals more or less flattened. Prosternum horizontal and margined at apex. Length 11-12 mm., breadth 3.4 mm. Mount Mitchell and Black Mts. of North Carolina ..... *palmi* Schaeffer

–. Eyes quite prominent and convex; sides of prothorax arcuate in front, almost straight or very feebly sinuate and convergent to obtuse hind angles, basal impressions sharply linear and lunate in front, broadly and deeply expanded toward hind angles behind; elytral intervals convex throughout. Prosternum rounded and declivous behind, not margined. Length 12 mm., breadth 4-5 mm. Wawari, Wash., and adjacent parts of Idaho..... *lanei* Van Dyke

These three species are all rare in collections. They all dwell in very wet or boggy regions. Of *humidula*, I now have five specimens including the type, all from the wet belt of coastal Washington and Oregon, in the true Vancouveran faunal area. This species is also the most distinct of the three. Of the second, *palmi*, intermediate in size between the other two, I have twenty-nine specimens, all collected by myself in the Black mountains of North Carolina, in the heart of the true Alleghanian faunal area. This series also shows a great deal of variation as to the shape of the prothorax. The much flattened eyes and horizontal and margined prosternum will readily separate this species from the others though it superficially very much resembles the following. Of this last species, *lanei*, I have only the type though I have seen others. It is the largest of the three.

Feronia (Cryobius) blaisdelli Van Dyke, new species

Small, narrow and elongate, gracefully formed, black and shining, antennae and legs rufous, in one specimen piceous. Head about as broad as long, as wide as apex of prothorax, front smooth, frontal grooves lunate and well impressed; mandibles prominent, porrect; eyes moderately arcuate and prominent; antennae long and delicate, extending beyond base of elytra. Prothorax as broad as long, apex feebly emarginate, sides arcuate in front, narrowed and sinuate at posterior fourth, thence straight and parallel to acute right-angled hind angles; disk with median longitudinal line finely impressed, anterior transverse impression well defined, posterior evident, basal impressions lunate, linear, extending forward almost to middle, basal area somewhat rugose, hind angles broadly and obliquely flattened and gradually elevated outwardly, without well marked carinae, base feebly emarginate and without margin. Elytra elongate-elliptical, two-fifths longer than head and prothorax combined, humeral angles obliquely rounded, sides feebly

arcuate at middle, broadly rounded and somewhat sinuate to apex; disk slightly convex, more or less flattened at middle, stria finely impressed, less well defined at sides and apex and finely somewhat obscurely punctured. Legs long and delicate. Prosternum with broadly reflexed margin. Males with well dilated front tarsi. Length 7.5 mm., breadth 2.75 mm.

Holotype, male, allotype, female (Nos. 5304 and 5305, C. A. S., Ent) and three paratypes, all collected by Dr. F. E. Blaisdell at Nome, Alaska, during July, 1900.

This graceful and distinct member of the subgenus *Cryobius* is more like an elongated *Trechus* than like its relatives, though some of the species like *hudsonicus* Lec. resemble it somewhat but are far more robust in every regard. I have checked this species against the descriptions of Sahlberg and Poppius but cannot find any that would apply to it.

Evarthrus (Ferestria) taurus Van Dyke, new species

Rather small, short and robust, smooth and shining, black, femora piceous and tibiae, tarsi, antennae, and generally much of front part of head, especially clypeus, rufous. Head almost as broad as long, front smooth, frontal impressions distinct; eyes rather large, moderately convex; antennae robust, extending to posterior fourth of prothorax; mandibles robust and striate, terminal segment of labial palpi longer than preceding, the latter generally with two setae. Prothorax somewhat lunate, over one-fourth broader than long, front margin feebly emarginate, sides broadly arcuate to behind middle, thence narrowed and convergent to base, side margin absent and hind angles eliminated; disk feebly convex and shining, median longitudinal line finely impressed, anterior transverse impression sharply impressed, posterior transverse impression generally obsolete, basal impressions elongate-punctiform and deeply impressed. Elytra cordiform, humeral angles well rounded, sides arcuate, narrowed posteriorly, oblique and slightly sinuate before apex, margin narrowly reflexed; disk convex, striae at most finely impressed though generally more or less obsolete, the single dorsal puncture about at middle of third interval close to second stria. Beneath quite smooth. Legs rather robust, the male front tarsi feebly dilated. Prosternum sulcate behind. Length 11 mm., breadth 4 mm.

Holotype, male, allotype, female (Nos. 5306 and 5307, C. A. S., Ent) and fourteen paratypes, all collected by myself near Punta Gorda, Florida, February 5-10, 1940. Besides these I have before me three slightly smaller and narrower specimens, two collected by me near Brooksville, Harnando County, Florida, January 20-30, 1940, the third in the Fenyes collection of the Academy, merely labeled "Fla., Bowditch."

This bull-like species superficially resembles *Evarthrus* (*Ferestria*) *morio* (Dej.) especially the smaller specimens of the former, but it can always be definitely separated by the absence of the side margin to the prothorax which is so evident in *morio*. It is also generally larger, the type series, and more powerfully built.

Evarthrus (Ferestria) hernandensis Van Dyke, new species

Rather small, short, and robust like the previously described species, smooth and shining, black, antennae, palpi and legs rufous. Head 5 mm. narrower than long, front smooth, fronto-clypeal suture fine, frontal impressions distinct; eyes rather large and convex; antennae robust, extending to posterior fourth of prothorax; mandibles robust, terminal segment of labial palpi longer than preceding, the latter bisetose. Prothorax transverse, almost twice as broad as long, front margin feebly emarginate, sides arcuate to behind middle, thence obliquely convergent to obtuse and somewhat rounded hind angles, side margin complete and slightly reflexed; disk feebly convex and very shining, median longitudinal line finely impressed, anterior transverse impression vague, the posterior also vague, basal impressions short, linear, moderately impressed. Elytra elongate, cordiform, humeral angles well rounded, sides feebly arcuate, almost straight at middle, gradually narrowed behind and sinuate before apex, the side margin narrowly reflexed; disk convex with six deeply impressed, finely punctured striae, obliterated toward apex, intervals quite convex, the single elytral fovea slightly behind middle on third interval. Beneath smooth and shining. Legs fairly robust, anterior male tarsi feebly dilated as in the former species and its close relatives. Prosternum sulcate behind. Length 11 mm., breadth 3.75 mm.

Holotype, male, and allotype, female (Nos. 5308 and 5309, C. A. S., Ent.), collected by myself, near Brooksville, Hernando County, Florida, January 20-30, 1940.

This species is in size and shape much like the preceding species but is readily separated by possessing a margin to the prothorax and having deeply striate elytra. It also somewhat suggests the larger specimens of *Feronia* (*Gastrosticta*) *tumescens* (Lec.) because of its stocky form and deeply striate elytra.

Evarthrus (Anaferonia) constrictus ovipennis Le Conte

In the *Biologia Centrali-American*, H. W. Bates describes one species of *Evarthrus* as *constrictus* and Csiki, in the *Coleopterorum Catalogus*, changes the name to "*Batesellus*" as the name *constrictus* had been previously used by Say. Csiki placed the species in the subgenus *Cyclotrachelus* where it no doubt be-

longs. I have a series of seven specimens of another species, from Mexico, collected at 9,300 feet, near El Salto, Durango, by M. A. Embury. These specimens cannot be separated from specimens of *ovipennis* Lec., collected in various places in the mountains of New Mexico. It is, of course, nothing but a smooth variety or subspecies at the most of the true *constrictus* Say now placed in the subgenus *Anaferonia.*

In this connection, I wish to state that I believe all of the Feronians in this country with a single dorsal elytral fovea should be included in the single genus *Evarthrus* Lec. That would include *Anaferonia* Csy., *Cyclotrachelus* Chd., *Eumolops* Csy. and *Ferestria* Leng as subgenera. *Megasteropus gigas* Csy. is a synonym of *Eumolops heros* (Say). The labial palpal characters are not always reliable because they are variable, and the variations in general shape upon which many of the so-called genera have been founded are not fundamental, merely divergencies. *Evarthrus*, as first conceived by Le Conte, is a genus whose species other than having the single elytral fovea, all have a common facies which unites them. Its main center of distribution is in the southeastern part of the United States and it is undoubtedly a genus of American origin. It is a definite unit, even though at times hard to properly define, and stands well apart from all other Feronians in America. I also most certainly do not agree with Csiki, the European cataloguer, in placing it as a subgenus or series of subgenera under *Pterostichus* Bon. or more properly *Feronia* Latr.

Amara (Cyrtonotus) durangensis Van Dyke, new species

Of moderate size, elongate, moderately convex, smooth and shining, black to piceous or brown, antennae, palpi and legs lighter, piceous to rufous. Head five-sevenths as wide as prothorax, smooth, frontal impressions rather deep, eyes quite prominent, antennae reaching behind base of prothorax. Prothorax about one-fourth wider than long, base definitely wider than apex, apex emarginate, margined toward sides, sides arcuate in front, sinuate and narrowed slightly in front of base to right-angled hind angles, base feebly arcuate; disk smooth with median longitudinal line finely impressed, anterior transverse impression absent or vague at the most and apical area without punctures, basal area generally with a limited number of punctures, mostly confined to basal impressions which are well impressed, distinctly bifoveate, and with a moderately acute carina as their outer boundary. Elytra somewhat elliptical, more than three-sevenths longer than broad, considerably narrowed basally, basal angles well rounded, sides arcuate, broadly rounded and sinuate before apex; disk with striae

complete, finely impressed and generally finely, vaguely punctured though often impunctate. Middle tibiae with two well marked spines. Length 11 mm., breadth 4 mm.

Holotype, male, allotype, female (Nos. 5310 and 5311, C. A. S., Ent.) and numerous designated paratypes from a series of forty-four specimens in my collection, collected at Juan Manuel, El Salto, Durango, Mexico, alt. 9,300 feet, by M. A. Embury.

H. W. Bates, in the *Biologia Centrali-Americana*, mentions two species of the subgenus *Cyrtonotus* as being found in Mexico: *putzeysi* Bates and *deparcus* (Say). The former, of which I have a specimen before me (Koebele Coll.), is much larger in every regard, besides is distinctly punctured over the apical portion of the pronotum, has the elytral striae distinctly punctured, the intervals much broader and flatter and the elytra at base somewhat square shouldered. Say states that *deparcus* has the pronotum "deeply punctured" in front as well as behind and that the elytral striae are obsolete before the tip, neither of which conditions fits this species. This species also differs considerably from any of the species found north of the Mexican boundary. A striking feature of *durangensis* is not alone its general smoothness and reduced punctuation, but its somewhat elliptical afterbody which is due to the evident atrophy of certain structures near the base. As indicated in the description given above, there is considerable variation among the specimens of the series which I possess.

Agra aethiops Van Dyke, new species

Rather large, jet black and shining throughout. Head about one-fourth longer than broad across eyes, postocular area feebly narrowed and broadly rounded before constricted neck, front smooth and shining, frontal impressions deeply impressed; antennae reaching beyond base of elytra; eyes prominent. Prothorax one-third longer than broad, narrowed and parallel-sided at apex, feebly arcuate and gradually wider to posterior third, thence sinuate and narrowed to base; disk feebly convex, smooth and shining, median longitudinal line finely impressed, area on either side finely, transversely wrinkled, a few small punctures in a row on sides and marginal groove rather deep and somewhat coarsely, irregularly punctured. Elytra less than twice as long as broad, humeral angles prominent, base margined, sides sinuate, gradually wider to posterior fourth, apex obliquely truncate with sutural angle acute and an acute spine at outer angle; disk with all striae complete, well impressed and finely, closely punctured, intervals at middle twice as broad as striae, narrowed laterally, third, fifth and seventh with a limited number of small foveate punctures generally along their inner margin. Beneath smooth and shining, a few punctures

on metaepisterna and abdominal sclerites, feebly aciculate at sides and near hind margins. Median lobe of prementum not greatly prolonged and rounded apically. Legs long and slender, anterior tarsi of males broadly dilated, 2-4 transverse, the fourth deeply bilobed as usual. Length 22 mm., breadth 5.5 mm.

Holotype, male (No. 5312, C. A. S., Ent.) and four paratypes, all collected at Venedio, Sinaloa, Mexico, July 16-30, 1918, by J. August Kusche.

This species is apparently near *Agra eurypelma* Bates but differs by being entirely of an inky black color, antennae and legs included by having the postocular part of the head broadly rounded, slightly narrowed posteriorly, not "gradatim angustato" and the pronotum not grossly punctate. It does not appear to agree with any of the other known species of the genus.

Stenomorphus rossi Van Dyke, new species

Very elongate, narrow, considerably flattened above, dark rufous, legs rufotestaceous. Head narrow and long, 2.5 mm. broad, 3 mm. long, neck long, 1 mm., and cylindrical, eyes moderately convex and prominent, antennae delicate, reaching to posterior quarter of prothorax, upper surface of head smooth and shining behind, sparsely punctured in front, especially on clypeus, labrum finely punctured and alutaceous. Prothorax long and elliptical, length 5.5 mm., breadth 2.5 mm. at apex, 3.5 mm. at middle and 2.25 mm. at base. Sides evenly arcuate from apex to posterior third, thence narrowed and feebly sinuate to base; disk much flattened, shining, median longitudinal line finely, not sharply impressed, anterior transverse impression obliterated, basal impressions well impressed. Elytra 8 mm. long, 4 mm. broad slightly behind the transverse base, thence gradually narrowing to posterior fourth and arcuate and feebly sinuate to apex; disk feebly convex, somewhat less flattened than pronotum, striae well impressed, intervals feebly flattened. Legs long and delicate.

Male. Front femora subangulate below near apex, middle femora with distinct rectangular and acute tooth below near apex, middle tibia feebly arcuate and densely pubescent from beyond middle to apex on inner side, first segment of anterior tarsus feebly dilated.

Female. Similar in general to male except slightly shorter and with prothorax a bit broader proportionately at base. Length 16 mm, breadth 4 mm.

Holotype, male, and allotype, female (Nos. 5313 and 5314, C. A. S., Ent.), collected near the railroad station at Chiricahua, Arizona, August 11, 1940, by Dr. E. S. Ross.

This species is proportionately the most elongate and delicately formed species that we have in our fauna. At first glance

it somewhat suggests *manni* Darl. from Haiti. Its small and long head, especially long neck, and elongate-elliptical and much flattened prothorax will readily separate it from any of our other species. It is less robust than *convexior* Notm., *californicus*, Mén. or *penicillatus* Darl. Its middle tibiae are suggestive of *sinaloe* Darl. as shown by Darlington's plate (Pan-Pacif. Ent., XII, p. 42, 1936), but its prothorax is very different. The first segment of front tarsus in the male is also much less dilated than is the case in our other species.

Pseudomorpha parallela Van Dyke, new species

Rather small, narrow, elongate, subcylindrical, with parallel sides, rufopiceous and alutaceous. Head more than two-thirds as wide as prothorax, smooth, with a very few, minute punctures, chiefly a row across vertex, preocular lobes not prominent. Prothorax transverse, three-fifths as long as broad, as broad as elytra, moderately convex, with a few minute punctures at sides, apex bisinuate and finely margined, base transverse, sides straight and parallel behind, forming a continuous line with sides of elytra, arcuate and feebly convergent to apex in front, lateral margin finely reflexed. Elytra 4 mm. long by 2.5 mm. wide, with straight and parallel sides, finely margined, apex truncate, outer angles well rounded, the sutural narrowly rounded, disk with seven rows of coarse punctures, obsolete at base, each row with a limited number of punctures and each bearing an erect fulvous hair. Third and fourth ventrals with a small, transverse patch of short, golden pile at middle. Length 6.5 mm., breadth 2.5 mm.

Holotype (No. 5315, C. A. S., Ent.), a unique male, collected by Dr. F. E. Blaisdell at Warners, San Diego County, California, July 13, 1925.

This small, cylindrical species, would run close to *cylindrica* Csy. and *angustata* Horn in Notman's Key (Proc. U. S. Nat. Mus., Vol. 67, Art. 14, No. 2586, pp. 14-15), but it is considerably smaller than either, finely alutaceous, not smooth, and different as regards the punctation.

SYSTEMATIC NOTES CONCERNING AMERICAN ACRAEINAE

(Lepidoptera: Nymphalidae)

BY ROBERT W. L. POTTS
University of California, Berkeley

All members of the subfamily *Acraeinae* have heretofore been placed in a single genus, *Actinote*. Within this genus there is a marked natural division into two well-defined groups. Dr. K. Jordan (in Seitz, Gross-Schmett.) and others have noted this, but without according the groups a status above the section. It now appears that they merit generic standing.

ACTINOTE Hübner, s. str.

Forewing underneath between costal and subcostal veins not entirely scaled, but bearing bristles, at least in distal portion. Usually without a central row of bristles on disco-cellular fold of hindwing. Lowland tropics.

Type species: *Papilio* (*Heliconius*) *thalia* Linnaeus.

Altinote Potts, new genus

Forewing underneath scaled between costal and subcostal veins in distal portion, not normally bearing bristles; hindwing beneath always with a central row of bristles on disco-cellular fold. Mountainous tropics.

Type species: *Heliconius neleus* Latreille.

In general *Altinote* may be distinguished from *Actinote* by color pattern and distribution. *Actinote* contains only species with patterns on both wings, being normally more or less transparent and thinly scaled, yellowish or whitish in tone with dull or rarely dark markings. *Altinote* normally show patterns on the forewing or underside only, these being bright red, orange, yellow or white against a consistently dark ground often showing irridescence, only a few species exhibiting any hindwing pattern and only one becoming dull; all being rather densely scaled. The *Altinote* are typically confined to the Andes and its outriders, while the *Actinote* center in the Amazon basin and are commonest near tidewater, although there is a considerable overlapping.

Within the genus *Altinote* two sections, herewith raised to the status of subgenera, may be recognized:

Subgenus Abananote Potts, n. subg.

Hindwing underneath with long scattered bristles between the veins in the discal cell, above and below it, and usually also on disc.

Type species: *Acraea abana* Hewitson.

Subgenus ALTINOTE, s. str.

Hindwing underneath without scattered bristles in the discal cell, above it, or on disc; rarely with a few scattered bristles below cell not on reduced postcubital vein.

Type species: *Heliconius neleus* Latreille.

The subgenus *Abananote* contains the species *radiata, erinome, abana, hylonome* and *euryleuca.* In general the pattern of these is confined to the disco-apical portion of the forewing, occasionally extended inwardly toward the base. The subgenus *Altinote*, containing the numerous remaining species, has the pattern characteristically basal, often with an apical band in addition. Underneath, the striping of *Abanote* is normally strong and even, whereas in *Altinote* it is irregular, parti-colored, and in bands or areas.

Altinote (Altinote) brownorum Potts, new species

Male black and red-orange, belonging to *eresia*-group. Forewing with red-orange transverse band of elongate spots, nearly straight; dark discal band much widened inwardly becoming triangular, reaching almost to base posteriorly, leaving only basal half of discal cell and subcostal cell colored, with colored basal spot in costal cell and some color below discal cell. Hindwing with curved color band mostly outside discal cell, halfmoon shaped across disc, extending basally at inner and costal margins, distally notched at veins and intervenal stripes; red-orange at end of discal cell fading to orange, yellow and finally whitish at both margins. Underneath similar to *eresia*, except that forewing repeats dark discal band reduced, a wide transverse colored band being formed, narrowly margined white distally; ground darker, thus stripings and lunules, as well as white discal band of hindwing much more prominent. Forewing, 24.0 mm.

Female very similar; ground color somewhat duller, red-orange not so bright. Underneath a tendency to white in costo-basal portion of dark area within white discal band. Forewing, 28.0 mm.

Holotype ♂ and allotype ♀ taken in copula, YUNGUILLA, 1700 M, ECUADOR, with 2 ♂ paratypes, one from Yunguilla, one from Rio Blanco, 1700 M, Ecuador, collected in May by F. Martin and Hazel Brown for whom the author wishes to express his sincere admiration with this dedication. In addition one ♀ paratype from Baños, 1800 M, Ecuador, also collected in May by Clarke McIntyre. All in the author's collection.

Variation in the paratypes illustrates a tendency for the distinctive dark discal band of the forewing to become larger, while the color pattern of the hindwing tends toward reduction, and may become partially obscured.

A NEW LEAFHOPPER FROM OCEANIA
(Homoptera Cicadellidae)

BY P. W. OMAN

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture
Washington, D. C.

The abundant material upon which the following description is based was received for determination from C. E. Pemberton of the Experiment Station of the Hawaiian Sugar Planters' Association and from Norman W. Frazier of the University of California. Few insects are known to occur on Canton Island, and this is said to be the only representative of the Cicadellidae thus far established there. According to Dr. Pemberton the species has also been collected in Fiji, but material from that locality has not been available for examination.

Nesaloha Oman, new genus

Rather small, relatively robust leafhoppers resembling *Deltocephalus* Burmeister in general appearance but forewing with inner anteapical cell open basally and claval veins confluent on disk of clavus.

Head slightly wider than pronotum, anterior margin rounded; lateral margins of genae slightly sinuated; clypellus parallel-sided; crown convex, but little longer medially than next the eye; ocellus comparatively large, distant from the eye, about its own diameter. Lateral margins of pronotum short. Forewing short, barely reaching tip of abdomen, clavus with veins confluent on disk and with a cross-vein to claval suture basad of juncture of veins, inner anteapical cell open basally, central anteapical cell constricted but not divided, appendix comparatively large. Hind wing with four apical cells. Aedeagus and ejaculatory duct of male bifurcate.

Type of the genus: *Nesaloha cantonis* Oman, new species.

Nesaloha cantonis Oman, new species

Length of male 2.5 mm., of female 3 mm. Ground color yellowish white, intensity of markings extremely variable, ranging from pale brownish yellow to fuscous. Color pattern as follows: facial sutures, antennal pits, arcs on clypeus, a pair of large indefinite spots on crown each with an anterior extension bordering an apical white spot and a lateral extension behind the ocellus, a small spot on posterior margin of crown near each eye; an arc of sub-basal spots on pronotum; irregular and indefinite lines on disk of pronotum; basal triangles, a pair of discal spots, and a quadrangle

with base formed by transverse suture on scutellum. Forewing usually with irregular brown lines in cells and along veins, especially distally. Thoracic venter usually brown. Abdominal tergites usually brown to fuscous, abdominal sternites usually margined with brown. Legs pale or lightly banded with brown.

Sternite VII of female about one and one-half times as long as sternite VI, posterior margin slightly produced and rounded or faintly sinuate and with a very shallow, flaring, median incision. Male plates broad basally, tapering abruptly to form rather long, slender, digitate extensions. Pygofer with a triangular sclerotized process dorsally. Style, aedeagus, and connective as illustrated.

Fig. 1. A, Dorsal view of style, connective and aedeagus. B, Lateral view of aedeagus.

Nymphs of the usual deltocephaloid type, apex of head subangular; later stages with face brown or fuscous except laterally, head, thorax, and abdomen rather heavily marked with brown and occasionally partially or wholly suffused with red; early stages without markings.

Holotype male, allotype female, and numerous paratypes from Canton Island, August 1, 1940, collected from the foliage of *Boerhaavia diffusa* L. by R. H. Van Zwaluwenburg. Other paratypes from the same locality collected from *Boerhaavia tetranda* Forst., August 26, 1940, by R. Danner. Types in the collection of the U. S. National Museum, paratypes in the collection of the Experiment Station of the Hawaiian Sugar Planters' Association, the California Academy of Sciences, and the Bernice P. Bishop Museum.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

H. H. Keifer	H. M. Armitage	E. G. Linsley
Vice-President	*President*	*Secretary*

Proceedings

One Hundred and Seventy-second Meeting.

The one hundred and seventy-second meeting of the Pacific Coast Entomological Society was held at 2 p.m. on January 24, 1942, in the entomological laboratories of the California Academy of Sciences. President Armitage in the chair. The following members were present: H. M. Armitage, E. G. Linsley, H. L. McKenzie, E. R. Leach, E. S. Ross, A. E. Michelbacher, E. O. Essig, W. W. Sampson, H. P. Chandler, R. C. Miller, E. C. Zimmerman, C. D. Duncan, E. C. Van Dyke. Visitors were present as follows: Gordon F. Smith, B. Prendergast.

The minutes of the previous meeting were read and approved.

The membership committee proposed Mr. G. F. Smith, Mr. E. Jones and Mr. T. Aarons for membership. They were duly elected.

The president then called for a report from the committee on nomenclature. Dr. Linsley reported that the plan submitted by the Pacific Coast Entomological Society for the formation of an American Committee on Scientific Nomenclature in Entomology had been accepted by the Entomological Society of America and the American Association of Economic Entomologists and that such a committee was now in the process of formation. Dr. Ross moved that the Society's committee on nomenclature (G. F. Ferris, chairman; E. G. Linsley, R. L. Usinger) be made permanent in order that it might co-operate with the national committee. The motion was seconded and passed.

The president announced that the annual spring field trip was near at hand and appointed a committee consisting of C. D. Duncan, A. E. Michelbacher, and R. F. Smith to determine the date and place of the trip and report to the Society at its next meeting.

Mr. E. C. Zimmerman, Entomologist of the Bishop Museum in Honolulu, spoke of his recent sojourn on the mainland. He stated that he had visited most of the museums and entomological institutions in the country in search of data for a forthcoming work on the "Insects of Hawaii" as well as to study museum methods.

Dr. Ross exhibited a portion of the Riddel collection of *Zerene* butterflies. Of particular interest were a gynandromorph and unusually fine series of color variations in *Z. eurydice* Bdv., commonly known as the dog-face or flying pansy butterfly.

The President presented Mr. Howard L. McKenzie who gave an illustrated talk on the "Biology, Systematics and Economic Importance of some species of *Matsucoccus*."

Mr. McKenzie stated that fourteen species of *Matsucoccus* have been described to date, and of this number thirteen occur on various species of *Pinus* in the New World. Many yet remain to be described.

Seasonal history records of several species of *Matsucoccus* indicate that there is a motile adult female and a winged male emerging in early spring from an over-wintering, intermediate, or preadult stage larva. After copulation the adult females either settle on the stems, in needle fascicles, in deep bark crevices on the main bole of mature trees, or under the bark scales on the stems of twigs, where they secrete wax and lay eggs. The first stage larvae transform during midsummer into an apodous, intermediate, or preadult stage, in which no trace of legs or antennae is evident. They overwinter in this stage and thus require a year to complete their life cycle.

Field experiments have proven that the so-called "twig blight" in various forests in Arizona and New Mexico is caused by the margarodid, *Matsucoccus vexillorum* Morrison. The larvae of this scale insect produce a necrotic condition on the stems of branches which ultimately becomes infiltrated with resin. This resined lesion is responsible for final death of the infested branch.

In California *Matsucoccus bisetosus* Morrison appears to play a major role as a weakener of mature ponderosa and Jeffrey pine. The larvae of this scale apparently prefer to settle in the axils of twigs, although many are also found under the bark scales on the stems. Infestations in twig axils causes a necrosis, and finally a resined condition of the cortical tissue. Girdling lesions are ultimately produced and these appear to cause death to the twig.

After a discussion of Mr. McKenzie's paper, the meeting was adjourned.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-third Meeting.

The one hundred and seventy-third meeting of the Pacific Coast Entomological Society was held at 2:15 p.m. on Saturday, February 28, 1942, in the entomological laboratories of the California Academy of Sciences. Professor G. F. Ferris in the chair. The following members were present: G. F. Ferris, E. G. Linsley, E. S. Ross, W. W. Sampson, R. L. Usinger, E. C. Van Dyke, A. C. Smith, J. W. Johnson, E. A. Smith, C. D. Michener, W. Y. Chong, C. B. Eaton, D. DeLeon, A. P. McKinstry, E. R. Leach, R. C. Miller, C. D. Duncan, J. W. Tilden. Visitors were present as follows: J. R. Walker, John T. Medler, Mary H. Michener.

The membership committee proposed the name of Mr. John R. Walker. He was duly elected to membership.

Upon the recommendation of the program committee it was moved, seconded and passed that during the present emergency our meeting frequency be limited to four regular meetings (September, November, January, and March) and one annual field trip each year. The date of the 1942 field trip was set for April 26.

Dr. Van Dyke proposed the compiling of a list of classical col-

lecting localities on the Pacific Coast of North Amercia. Considerable discussion followed, all favorable to the suggestion.

Dr. Usinger exhibited specimens of the remarkable heteropterous family Termitaphididae, which are related to Aradidae but have been confused with Homoptera. He mentioned that they are listed as aphids in Patch's host list of world aphididae. The present examples were received from Adamson in Trinidad, where they live with *Heterotermes tenuis*, the only known host out of approximately 150 species occurring on the island. Dr. Usinger also mentioned that he and Dr. Linsley had repeatedly found the aradid, *Mezira reducta* Van D., in nests of *Zootermopsis* in California.

Dr. Ross exhibited a painting of H. H. Behr, former curator of insects at the Academy (approx. 1867-1877).

Dr. DeLeon remarked that he was compiling a list of insects attacking *Sequoia*. He mentioned that he had been unable to find authentic records of *Vespamina sequoiae* H. Edw.

Professor Ferris reviewed the recent movement for an American Commission on Scientific Nomenclature in Entomology. He read the proposal of the Pacific Coast Entomological Society which had been accepted by the Entomological Society of America and the American Association of Economic Entomologists. He stated that the commission had now been formed and would be ready soon to receive questions. He commented that among the problems which had been suggested by various systematists were the questions of priority in names of higher categories, primary and secondary homonyms, and misidentified genotypes. In connection with the last problem he read a recent article by Riley (1941) on the subject.

Dr. Miller discussed the subject of types: He stated that the California Academy of Sciences now had 10,933 primary types, of which 8,935 were holotypes, 3,526 of insects. The types have recently been moved to a safer place for the duration, can be moved again if necessary at a moment's notice. He emphasized the advisability of depositing types in an institution, remarking that the International Rules recommend that types be deposited in a museum and given a type number.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-fourth Meeting.

The one hundred and seventy-fourth meeting of the Pacific Coast Entomological Society was the annual field trip held at Russelman Park, Contra Costa County, California, April 26, 1942. The following members were present: H. M. Armitage, E. G. Linsley, A. E. Michelbacher, W. F. Barr, J. W. Tilden, C. D. Duncan, J. W. MacSwain, E. C. Van Dyke, T. F. Kelley, G. F. Smith, H. P. Chandler, K. S. Hagen. Visitors were present as follows: Mrs. A. E. Michelbacher, Mrs. E. G. Linsley, Mrs. C. D. Duncan, Mr. Ellsworth Hagen, Mr. Donald de Coss, Mr. Jack Corbett, Mr. Harold Madres, Miss Catherine Reed, Mr. W. E. Ferguson, Miss Doris Dow, and Miss Maxine White.

The group assembled at the picnic grounds at 10:00 a.m. and

spent the day collecting or visiting. Flowers were abundant and collecting of Hymenoptera and Diptera was especially profitable.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-fifth Meeting.

The one hundred and seventy-fifth meeting of the Pacific Coast Entomological Society was held at 2:30 p.m. on September 5, 1942, in the entomological laboratories of the California Academy of Sciences. Vice-president Keifer in the chair. The following members were present: H. H. Keifer, E. G. Linsley, R. W. L. Potts, A. J. Walz, K. S. Hagen, G. F. Smith, E. C. Van Dyke, G. F. Ferris, R. L. Usinger, R. C. Miller, P. A. Harvey. Visitors were present as follows: C. E. Kennett, T. F. Evernden, C. Golden, B. E. Sagal, D. L. Dow, P. Moorhead, W. R. Cobb, E. Goldsworthy, W. Allen, W. F. Chamberlain, and B. Prendergast.

The membership committee proposed the name of Mr. Peter Moorhead. He was duly elected.

The chairman announced that the next meeting would be devoted to the annual address of the retiring president and to the election of officers for the coming year. He appointed a nominating committee consisting of C. D. Duncan, P. C. Ting, and R. L. Usinger, chairman.

The chairman called on Professor Ferris to report on the progress of the American Commission for Scientific Nomenclature in Entomology. Professor Ferris reported that 14 acceptances had been received to invitations to serve on the Commission, that public notices of the organization of the Commission had been sent to *Science* and the various American entomological journals, and that several problems had already been submitted for consideration. He stated that probably the first question which would be considered was that of primary and secondary homonyns.

Dr. Van Dyke reported on his recent trip through the southwestern United States in the company of H. A. Scullen. He stated that they had gone to northern Arizona in early June and although collecting was moderately good around Prescott, that the region in general was the driest it had been in 40 years. They proceeded through New Mexico to the Davis Mountains, Texas, an isolated uplift with good roads and an interesting fauna. This region had first been fairly well collected by Wenzel, more recently by Knull. Among the interesting captures was a long series of *Plusiotus woodi* Horn, a brilliant scarab which flies at dusk and in the early morning, resting during the day on foliage of walnut. From the Davis Mountains they went to Alpine, then south to the Big Bend Country and Chisos Mountains, returning through New Mexico to southern Arizona. In the Chiricahua Mountains, large congregations of a meloid, *Epicauta pardalis* Lec., were found.

Mrs. Prendergast spoke of her work with *Blissus mixtus* Barber which breeds in the sand dune areas of San Francisco. She said that in spite of difficulties in rearing she had now worked out the various developmental stages.

Mr. Hagen mentioned recent collecting trips into southern California. He particularly called attention to the success of night beating in desert areas, suggesting that desert insects are active at night in order to avoid birds. He stated that by this method he had collected six new species of *Coenonycha*.

Dr. Linsley spoke of the work of the University of California summer course in Entomology at Miami Forest Insect Station of the Division of Forest Insects, Bureau of Entomology and Plant Quarantine, near Fish Camp, Madera County, California. He mentioned particularly finding the remains of hundreds of males of *Pleocoma hoppingi* Fall in coyote feces under conditions suggesting that this species has a spring rather than a fall flight period. Of particular interest also was the finding of the phycitid moth, *Vitula serratilineella* Rag., breeding in the nests of *Xylocopa orpifex* Smith and *X. californica* Cresson along with the tenebrionid, *Aphanotus brevicornis* (Lec.), a species of *Cryptophagus* and dermestids of the genera *Attagenus* and *Trogoderma*. All of these belong to groups of insects which are household or stored food products pests.

Mr. Moorhead spoke of the extermination of *Ceanothus*, important for browsing cattle, in many parts of the Sierra Nevada Mountains, by the oyster shell scale, *Lepidosaphes ulmi* (Linn.). Dr. Linsley commented that the same insect had killed large areas of *Ceanothus*, *Salix*, *Populus*, and even *Ribes* in Madera County and had practically exterminated a beautiful grove of aspen at Miguel Meadows in Yosemite National Park. Dr. Usinger and Miss Sagal both commented further on the latter infestation, tracing its history over a period of years.

Mr. Keifer spoke of the increasing importance of the grape leaf skeletonizer, *Harrisiana brillians* B. & McD. Originally described from Yuma, California, in 1910, it belongs to a Neotropical group of about 46 species (7 in United States) all of which breed on grape or its relatives (Vitaceae). Little is known of the extent of the distribution of the species. It has been known in San Diego County about two years.

Dr. Usinger stated that the mystery as to where the black grass bugs (*Irbisia*) breed may have been solved. He has found that they apparently imbed their eggs in the stalks of *Artemesia vulgaris*, where they overwinter.

Professor Ferris stated that the first part of his *Atlas of Scale Insects*, covering the family Diaspididae, was complete and that he was now planning to undertake a study of the Pseudococcidae. He stated thta he had approximately 175 specific names to consider in the United States alone and about 75 generic names.

The meeting adjourned at 4:35 p.m.—E. G. LINSLEY, Secretary.

One Hundred and Seventy-sixth Meeting.

The one hundred and seventy-sixth meeting of the Pacific Coast Entomological Society was held at 2:30 p.m. on December 5, 1942, in the entomological laboratories of the California Academy of

Sciences. President Armitage in the chair. The following members were present: H. M. Armitage, E. G. Linsley, M. A. Stewart, R. L. Usinger, T. Aarons, K. S. Hagen, E. O. Essig, H. H. Keifer, E. C. Van Dyke, W. W. Sampson, P. Moorhead, R. W. L. Potts. Visitors were present as follows: Pedro Galindo, Ellsworth Hagen, Lloyd Fowler, Loren Estabrook, and Alvesta Myers.

President Armitage issued a statement on the present status of the Society, calling attention to the fact that of approximately one hundred active members, twenty-one were now known to be serving in the armed forces of the United States. A list of the men so serving was read to the Society.

Dr. Van Dyke regretfully called the attention of the Society to the death of R. W. Doane, a long-time member. It was moved, seconded and passed that the secretary write a letter of condolence to Mrs. Doane on behalf of the Society.

Dr. Usinger reported receiving a recent letter from Lieutenant E. S. Ross, stationed in Texas, and exhibited the first few pages of an Atlas of Mosquitoes which Ross is now preparing. Usinger also exhibited specimens of *Metrobates trux* Bueno?, a relative of *Halobates*, which lives in swift running streams. The specimens were found in Putah Creek, near Davis, and constitute the first California record for the genus.

Mr. Keifer called attention to the series of articles on problems of Entomological Systematics in the most recent number of the Journal of Economic Entomology. He interpreted the series of articles and the amount of space devoted to them in the Journal, as an indication of increased interest on the part of applied entomologists in the problems of the systematist.

Mr. Keifer also spoke of the recent discovery of the oriental fruit moth, *Graphtholitha molesta* (Busck), in Orange County, California. Mr. Armitage commented that this was a good example of the role of the taxonomist in economic work and pointed out how much relied upon proper identification in problems of this type.

The nominating committee announced with regret the resignation of Mr. E. R. Leach who had served the Society as treasurer for a long time and at great personal sacrifice. The following names were proposed as officers for the coming year: H. H. Keifer, president; M. A. Stewart, vice-president; E. G. Linsley, secretary; R. C. Miller, treasurer; H. M. Armitage, member at large, Board of Directors. They were unanimously elected.

Mr. Armitage then turned the gavel over to the new president, Mr. Keifer. Mr. Keifer presented the new officers and then presided during the annual address of the retiring president entitled, "Possible economic relations of the Hawaiian insect fauna to California agriculture," (see p. 1).—E. G. LINSLEY, Secretary.